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**The Third Voice: Do Enhanced E-books Enhance the Benefits of Shared Story  
Reading with Preschoolers?**

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**Introduction**

There are innumerable benefits of reading with young children, and a wealth of evidence has demonstrated that sharing books helps children build their growing vocabularies and scaffolds the development of pre-literacy skills that will serve them from preschool on (e.g., Bus et al, 1995; Sénéchal and LeFevre, 2002; Zuckerman and Khandekar, 2010). Many parents and teachers understand the value of reading with young children before they can read on their own, but exactly how e-reading fits into the picture remains unclear. Caregivers are filled with questions whenever they select a book for their child. Are traditional books the best alternative or are there unique benefits to e-book reading? Can parents and teachers utilize e-book technology to foster learning? How can we promote communication and engagement, along with learning, when reading e-books?

E-books meant for children are a form of electronic text that contains key features of traditional print books, such as a child-friendly central topic, illustrations, and pages that “turn,” but e-books may also contain digital enhancements that make the reading experience qualitatively different, and perhaps more supportive (e.g., Hoffman and Paciga, 2014; Kucirkova, 2013; 2014). E-books often contain a combination of enhancements such as recorded narration, animations that dramatize the text, music, and even interactive games and “hotspots” that are activated with a mouse click or touch-screen tap. These “enhanced” e-book features can often be conceptualized along a continuum ranging from integral and supportive within the story, to unsupportive, irrelevant and/or distracting (De Jong and Bus, 2003; Labbo and Khun, 2000; Zucker et al, 2009). Thus, as Hoffman and Paciga (2014) outline, it is important to consider the

specific types of e-books and their features when we assess their potential benefits for young children.

The goal of this study was to explore the differences between two ways of using e-books in shared story reading that align with two different types of e-books available to children. In order to understand better whether enhanced e-books have added utility in promoting interaction, retention and engagement, we must consider how they change the dynamic between the parent and child as well as between the child and the story. Our study examined the roles adult readers play when using plain vs. enhanced e-books in story reading with young children. We first reviewed the literature on children and parents' use of e-book technology, specifically what benefits both print and e-books afford young listeners. We considered research on the multiple goals of shared reading that can be assessed, and focused on any comparisons in the research to date involving enhanced e-book features. The research literature on e-books is growing rapidly, but with mixed findings. Our study looking at the three-way interaction between parent, child *and* story adds new insight into the costs and benefits of "letting the e-book do the talking."

### **Current Literature on Electronic Storybooks**

How prevalent is the use of e-books among children? While this is a rapidly moving target, current data suggests e-books are becoming more common in the lives of young children even as parents are hesitant about whether they are a good choice. According to parents' reports from two recent studies, 72.5% of American parents with iPads share e-books with their children (Vaala and Takeuchi, 2012), and 20% of 3- to 4-year-old children use the computer for more than 30 minutes of e-book reading each day (Korat et al, 2013). Similarly, Marsh (2015) found that 3-to 7-year-old British children use tablets for over an hour a day on average. While this study did not look at e-books in particular, it did show that open-ended apps promote more creative play and children prefer them to other apps (Marsh, 2015). Despite this growing exposure to e-books, a recent *Atlantic* article described how ambivalent parents are about their

children reading e-books. Some individuals believe exposing their children at an early age will help them become confident using technology and allow them to learn new skills, while others believe that tablets could negatively affect their children's learning and socialization (Rosin, 2013). Similarly, a recent survey conducted of 120 parents from our local population garnered praise and criticism of e-book reading (Read, 2014). Some parents lauded e-books for allowing children to "read more independently." Others were wary of e-books, believing that conventional print books "are more engaging because [parents] can interrupt more to talk about them."

But what does evidence-based research conclude on the possible benefits of reading e-books? While e-reading has been an area of study since the mid-1990's, and has accelerated recently as researchers look more closely at contemporary e-book use and its consequences, there is not yet a definitive answer. This is because whether e-books deliver advantages to young readers depends on what goal or outcome is intended. The benefits of shared storybook reading may come from at least three sources: what meaningful interactions happen *during* book reading (Blewitt et al, 2009; Korat and Or, 2010; Nyhout and O'Neill, 2013; Whitehurst et al, 1988) what is retained afterwards in terms of plot, vocabulary or print recall (Chiong et al, 2012; Korat et al, 2013; Krcmar and Cingel, 2014; Parrish-Morris et al, 2013), and whether a child can become engaged enough with a story to foster an interest in reading more in the future (Chiong et al, 2012).

Research on the benefits of shared storybook reading has found that one key factor in learning from the experience is the richness of the dialogue that the reader and child have surrounding the book - the amount of extra-textual talk, especially that which encourages the child to discover meaning, to think abstractly, and to make predictions (Blewitt et al, 2009; Whitehurst et al, 1988). Do e-books afford such quality interaction? In a small exploratory study, Fisch et al. (2002) found that parents reading a type of enhanced e-book to their child asked the same types of extra-textual questions as would be expected in a conventional storybook reading. Since then, however, empirical measures of amount or quality of parent/child interaction during storybook reading have

found largely that there is *more* talk outside of the text of the story by parents and children when reading a print book vs. an e-book (Kim and Anderson, 2008). Extra-textual talk with print books also frequently expands beyond the content of the story to include questions that elicit non-immediate explanations and predictions and relate the story to a child's own personal experiences (Korat and Or, 2010; Krcmar and Cingel, 2014; Parish-Morris, et al, 2013). When researchers have included comparisons between print books and *enhanced* e-books with potentially distracting hotspots, the differences are especially highlighted. E-books can encourage more behavior- or device-related talk rather than the rich extra-textual interaction that occurs when reading conventional print books (Chiong et al., 2012; Korat and Or, 2010; Krcmar and Cingel, 2014; Parish-Morris et al, 2013). However, parents' previous exposure to a story may influence the depth of extra-textual interaction. Korat et al. (2013) found that mothers who were participating in an intervention with some training and familiarization with the books used more "high level support" (talk about personal experience, distancing, and talk about language/print) when reading educational e-books designed by the researchers compared to print versions of the same story. Thus, it is not always the case that print books automatically elicit higher quality interaction from parents, as it can depend to some extent on how practiced the parents are with a particular story.

E-book research also identifies a mix of advantages and disadvantages in other areas such as memory of the story, vocabulary retention and pre-literacy skills. Many studies have found no significant difference in story content or vocabulary retention measures when comparing print and e-books (Chiong et al, 2012; De Jong and Bus, 2002; 2004; Korat and Shamir, 2007; Korat et al, 2013; Ricci and Beal, 2002). In some cases, children's learning from stories fares worse in electronic conditions - Krcmar and Cingel (2014) found children remembered more events and characters directly from the story when they heard traditional books compared to e-books read by their parents. For younger 3-year-old children, remembering content and the sequence of story events was more difficult when they heard stories in e-book compared to traditional print versions (Parish-Morris et al., 2013).

The picture of results is more complicated when we consider that while Chiong et al. (2012) found that children's story comprehension suffered in enhanced e-book conditions compared to plain e-book and print readings, Verhallen et al. (2006) found that children remembered *more* story events in the "multimedia" vs. "static" e-books when there was no adult reader involved. Thus, the presence or absence of an adult reader weighs heavily in the investigation of children's potential learning from e-books. Korat and Shamir (2012) and Smeets and Bus (2012) found that children could learn vocabulary from independently reading e-books. But, the e-books used were designed by the researchers to deliberately include vocabulary support (e.g. embedded definitions or specific questions about that vocabulary). Segal-Drori et al. (2009) also found that specially designed e-books with scripted adult instruction resulted in better learning about print concepts than the equivalent print versions. However, Korat et al. (2014) found that having support from an adult reader resulted in better performance in word comprehension and production by 5-year-olds than independently reading e-books with static and dynamic vocabulary support. Taken together, these studies illustrate that while good quality e-books *can* help children learn new words, they may not fully replace the benefits of having an experienced and familiar live adult reader. This research raises an important issue for preliterate children in the preschool age-range who must rely on an adult reader to scaffold their storybook reading experience and unlock all its potential benefits.

Interestingly, those studies that have measured interaction during the story reading *and* types of retention afterwards (e.g., Chiong et al, 2012; Korat et al, 2013; Krcmar and Cingel, 2014; Parish-Morris et al, 2013) have not consistently found any relationship between how the text itself was read and discussed and how much children directly remembered or learned from it, raising the question of what *is* the most pertinent goal of shared reading - the immediate facts and skills attained from the book or the qualitative and extending interactions around it? Furthermore, what about other possible benefits like familiarizing a child with technology, or simply engaging them more to make reading more motivating? While there is less research on these outcome

measures, in one study Krmar and Cingel (2014) surveyed the parent beforehand on their child's technology experience and found that children high in technology experience performed better on retention measures in the traditional book condition than the e-book condition. So in one sense experience with e-book technology does not seem to provide children with an advantage. In addition, evidence does not suggest that e-books are more engaging than other story book types for young children. Chiong et al. (2012) took a measure of children's apparent engagement with e-books compared to print books by coding whether each parent-child dyad in their within-subject comparison seemed more engaged with either the print or the e-book that they read. They found that most (63%) were equally engaged with the two book types, while 31% of dyads were coded as more engaged with print over e-books, and only 6% showed the reverse pattern. Thus, even with the novelty, the bright screen, or the possibility of animation and touch-screen interaction, it does not seem to be the case that e-books are automatically or inherently more engaging. What, then, does make a storybook captivating for a young child?

The current literature suggests that it may be the adult readers (often parents) who play the central role in shaping learning outcomes and building personal connections during shared storybook reading, whether with print texts, plain e-books or even enhanced e-books. However, the book format may affect how much of a leading role the parent takes. Therefore, we explored whether the benefits of sharing a story differ depending on e-book type. Given that reading and elaboration can come either from an actively involved caregiver or from the narrated recording and built-in features of the book itself, ultimately the question is not about e-book vs. print (screen vs. paper), but rather it is about the effectiveness of good quality electronic enhancements compared to a live adult reader. Our study sought to investigate how differences between parent reader and electronic "reader" contributed to children's engagement in and interaction with the story as well as their retention of events and novel vocabulary in the story book.

We designed this study to highlight the possible benefits of e-book reading and paid close attention to three key features in our design. First, it was important to involve

parents as co-readers. Not only did keeping parents involved make the experience more comfortable for young children, it was also more ecologically valid. While some parents do allow their preschool aged children to interact independently with e-books on iPads (e.g., Vaala and Takeuchi, 2012), the vast majority of their story reading still happens with a caretaker and even their use of technology is supervised or scaffolded. Second, we considered multiple benefits of storybook sharing as described above, thus we measured the triple goals of interaction during the story, engagement with the story, and retention afterwards. And third, given the importance of e-book type and the specific features of an e-book on possible outcomes (e.g., Labbo and Khun, 2000; Zucker et al, 2009) we looked more closely at a comparison of two main types of e-books - a stripped-down “plain” version and an “enhanced” version of the same commercially available narrative stories. This comparison allowed us to avoid the device confound inherent in comparisons of e-books with conventional print books, whereby the novelty of a touchscreen tablet becomes the focus rather than the story that it mediates. In our study all children in both conditions interacted with the same technological device, but we focused on how that device fit into the story reading experience - either as a tool for the parent reader, or as a “third voice” leading the reading itself.

## **Research Context**

### ***Participants***

Thirty-eight pairs of child/parent dyads took part in this study. Of these, 19 participated in each condition (8 boys, 11 girls in enhanced; 12 boys, 7 girls in plain). One grandmother, two fathers and 16 mothers participated in the enhanced condition, while two fathers and 17 mothers participated in the plain condition. Each adult participant was a guardian who lived with the child they accompanied, and was a frequent (several times per week) reader to the child at home. In addition, while fathers and mothers may have slightly different reading styles (e.g., Anderson et al., 2012), the two conditions were balanced, each with only 2 male readers, so parent gender was



unlikely to have an effect on our findings. The children who participated ranged in age from 3 to 5.5 years old, with a mean age of 53 months ( $SD=10$ ). They were all typically developing, with English as their primary language, and they were from a largely well-educated, middle-class, ethnically diverse sample from the San Francisco Bay Area. Participants were recruited from local mothers' groups, an on-campus preschool, and a database of parents who had previously indicated an interest in research participation. Criteria for participation was that children be between the ages of 3-5, and use English as a first language. All child participants reportedly had prior experience with a touch screen device. Due to experimenter error, there was video loss for four participants resulting in no interaction or engagement data for three children in the plain and one in the enhanced condition, but their retention data was still included in the analyses. Once parents volunteered they gave informed consent for their children to participate in a storybook reading session investigating the use of e-books by signing an IRB approved consent form, and children gave their assent to participate by saying when they were ready to listen to the stories and then answer the questions. Both parents and children were told that they could stop anytime, and if children became too restless or frustrated they were reminded they could take a break or be all done.

### ***Materials and Procedure***

In our between-groups design study, child/parent dyads read two stories in either a plain or enhanced e-book format. In the plain e-book condition, parents read the stories and instructed children on how to navigate through the e-book. In the enhanced condition the reading app was used to present the same two stories but with narration, story comprehension and prediction question prompts, and hotspot animations with sound effects. The order of the two stories was counterbalanced in each condition. Participants were video-recorded while reading the stories in order for us to measure parent/child interaction and children's engagement as described below.

We used an iPad Air OS 7.1.2 to present the e-books in both conditions. The stories were chosen from the commercially available My Story World© reading app. The

first nine children heard the stories *Pedro the Penguin* and *Elmer and Butterfly*. *Elmer* was discontinued<sup>1</sup> from the reading app and replaced by *Harris Finds his Feet*, so the last 29 children (equally balanced between conditions) heard *Pedro the Penguin* and *Harris Finds his Feet*. All three of the stories used were age appropriate narrative stories, unfamiliar to parent and child, with full colour illustrations, swipe advance pages and all incorporated some challenging vocabulary words tested in the retention phase of our study.

For all the e-books, stories were pre-loaded and selected for participants on the iPad. In the enhanced condition parents selected the “Play and learn” reading option after the title page, and then the story advanced to the first page where text appeared at the bottom and the recorded narration “read” it in a female voice with a British English accent. After the text was narrated on a page, animated characters flashed and moved in correspondence with the story. Throughout each story the recorded narration prompted the child with approximately five story comprehension or prediction questions with picture identification aids; for example, in *Pedro the Penguin*, children in the enhanced condition heard, “Pedro has hit the ice. Tap on who you think is coming to help him” with an interactive image of two penguins with a stretcher that when tapped would prompt, “That’s right!”

The plain versions of the e-book stories were created by using screenshots of each of the pages from the original enhanced versions within the iPad’s camera roll. Parents were instructed to read the text at the bottom of the page, swipe through the stories at their own pace, and read however they normally would at home. Thus children heard the same stories accompanied by the same illustrations in each condition, but in the plain condition there were no animations, and while children could still touch the iPad to turn pages, any prediction, comprehension or labelling questions (as well as

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<sup>1</sup> Only six (3 in each condition) of our 38 participants heard the *Elmer and the Butterfly* story instead of *Harris Finds His Feet* and the stories were closely matched for length and complexity. All 38 participants heard the *Pedro the Penguin* story as well, and measures of children’s retention, engagement and interaction were all compiled across the two stories that they heard. Further, when compared statistically across all measures there were no significant differences (all  $p$ 's > .50). Thus, this factor was not included in any of the main analyses of condition differences.

side commentary) outside of the text came from the parent reader rather than the device.

### **Measures**

**E-book familiarity:** Before each reading session parent/child dyads were asked survey questions to indicate how familiar the child was with e-books. Parents were asked how often and for how long they typically read conventional print books and also e-books with their child, and how familiar the child was with using touch screen technology. Their responses with respect to frequency of e-book reading were categorized into “never,” “sometimes” (once a month or less), or “often” (from weekly to daily experience).

There were three primary sets of measures in this study as follows:

**Parent/child interaction:** Interaction between parents and children was operationalized for each dyad through six measures: 1) total number of extra-textual utterances across both stories by the parent, 2) total number of extra-textual utterances by the child, 3) total number of extra-textual utterances that were story-related (rather than device-related or behavior-related) (e.g., Parish-Morris et al, 2013; Nyhout and O’Neill, 2013) 4) total number of communication chains between parent and child, 5) average turn length of communication chains between parent and child, (e.g. Mualem and Klein, 2013) and 6) total number of instances of eye contact between parent and child (e.g., Kleinke, 1986).

Utterances were measured as phrases or clauses expressing a single message bounded by a clear pause (e.g., “What’s he doing?” or “Swipe the page”) (e.g., Kim and Anderson, 2008) and are frequently used to quantify amount of extra-textual talk in storybook reading studies (Blewitt et al, 2009; Fisch et al, 2002; Nyhout, 2013).

Communication chains, a unit recently measured by Mualem and Klein (2013) gave us an alternative view of interaction by operationalizing connected utterances rather than just totals. Communication chains were defined as back-and-forth turns between a parent and child in a conversation and communication chain length was the number of

turns that occur in a chain. We counted non-words (e.g., “uh-huh”) and clear gestures (e.g., pointing, tapping the screen and head nodding) as turns in communication chains, but only if they lead to verbal communication. While eye contacts have not been used as a measure in previous e-book reading literature, we chose to count them in this study because of they indicate joint attention between parent and child (e.g., Kleinke, 1986).

**Engagement:** Engagement with the story was examined through a measure of proportion of time that the child spent looking at the iPad from the start of each story until its conclusion. This was used as an indicator of children’s attention toward the story and the device (e.g., Kleinke, 1986). In addition we took observational notes about the qualitative level of interest in the story that each child showed based on their physical attentiveness or distractability (e.g., whether children seemed focused or “fidgety”).

**Retention after reading:** Lastly, children’s retention was evaluated through two self-designed measures taken directly after each story was heard, modeled on previous e-book and storybook reading research: 1) story vocabulary retention, tested with a 3-alternative multiple-choice picture task in which children were asked to point to the illustration for each of the five challenging vocabulary items identified in each story, (e.g., “Which picture shows a *dizzy* boy?”); and 2) story recall, tested with five open-ended questions about each story (e.g., “What did Pedro forget to do?”). Points were assigned to each child for total number of vocabulary retention questions answered correctly across the two stories (out of 10) and for each separate story event recalled across the two stories. Similar vocabulary retention measures using picture-pointing tasks tailored to the text of the story have been used in other e-book studies (e.g. De Jong and Bus, 2004; Ricci and Beal, 2002; Korat and Shamir, 2013) as well as count measures of story events recalled (e.g. Parish-Morris et al, 2013; Zucker et al, 2009).

## **Results**

### ***Age, Gender and Experience with E-books***

**Age effects:** We conducted a factorial analysis of covariance (ANCOVA) with Condition and Gender of the child as between subjects factors and Age of the child (in

months) as a covariate to first test these factors' effects on the quantitative measures of interaction, engagement, and retention. While there was no significant difference between the enhanced and plain conditions in children's mean age (for both conditions  $M=53$  months,  $SD=10$ ), there were significant bivariate correlations between age and retention measures such that older children identified more of the challenging vocabulary correctly ( $r = .41, p < .05$ ) and remembered more story events ( $r = .35, p < .05$ ). The ANCOVA showed that there was no main effect of Age on any of the six interaction variables or on children's proportion of time looking at the iPad (all  $p$ 's  $> .10$ , and all eta squared measures  $< .15$ ). However, there was a main effect of Age on both measures of retention (for vocabulary retention,  $F=5.299, p < .05$ , eta squared = .21; and for story event retention,  $F=9.029, p < .01$ , eta squared = .31) indicating, as the bivariate correlations had, that older children performed better than younger children on the retention measures.

**Gender effects:** While there were more boys than girls in the plain condition, and more girls than boys in the enhanced condition, there were no differences between gender in any of our measures. The ANCOVA showed that there were no main effects of Gender on any of the nine dependent variables tested in the study (six variables of interaction, proportion looking, and two retention variables), all  $p$ 's  $> .15$ , all eta squared measures  $< .01$ . There were also no interactions between Gender and Condition for any of these variables (all  $p$ 's  $> .05$ , all eta squared measures  $< .20$ ).

**Effects of e-book experience:** We found through our survey measure that 17 (7 in the plain, and 10 in the enhanced condition) of our child participants (45%) had never read an e-book; 9 participants (5 plain, 4 enhanced) or 24% had experienced e-books occasionally (once a month or less), and 12 participants (7 plain, 5 enhanced) or 32% had read e-books often (from weekly to daily). Despite variation in our sample's familiarity with e-books there were no main effects of Familiarity on any of our outcome measures ( $p$ 's all  $> .05$ ) and no interaction between Familiarity and Condition when we conducted two-way analyses of variance to investigate this factor's impact on the condition effects described below for each quantitative outcome variable. Thus,

children's level of experience with these kinds of books did not make a difference in how they were read by the parent or what children retained.

Most importantly, the ANCOVA revealed that there were significant main effects of Condition on all measures of interaction ( $F$  values between 5.74 and 9.22,  $p$ 's all  $<.05$ , eta squared values all  $>.25$ ) and proportion of time looking at the iPad ( $F=16.56$ ,  $p<.01$ , eta squared  $=.45$ ), but again no main effect of Condition on either of the retention measures ( $p$ 's  $>.20$ , eta squared values  $<.10$ ). Below we present the simple t-test comparisons by condition for each dependent variable tested keeping in mind the lack of gender effects overall, but the impact of age on our measures of retention.

### ***Parent/Child Interaction***

**Parent and child utterances:** We found significant differences between the enhanced and plain conditions in all three measures of total utterances (See Figure 1). Parents used more extra-textual utterances in the plain condition ( $M=105$ ,  $SD=110$ ) than parents in the enhanced condition ( $M=26$ ,  $SD=27$ ),  $t(16)=2.80$ ,  $p=.01$  (corrected for unequal variances). Children used more utterances in the plain ( $M=26$ ,  $SD=28$ ) than the enhanced condition ( $M=4$ ,  $SD=5$ ), corrected:  $t(16)=3.14$ ,  $p<.01$ . And, there were more story related utterances in the plain ( $M=89$ ,  $SD=98$ ) than the enhanced condition ( $M=18$ ,  $SD=22$ ), corrected:  $t(16)=2.81$ ,  $p=.01$ . These differences indicate that there was more extra-textual talk, especially that pertained to the story, when parents and children were reading a plain compared to an enhanced e-book.

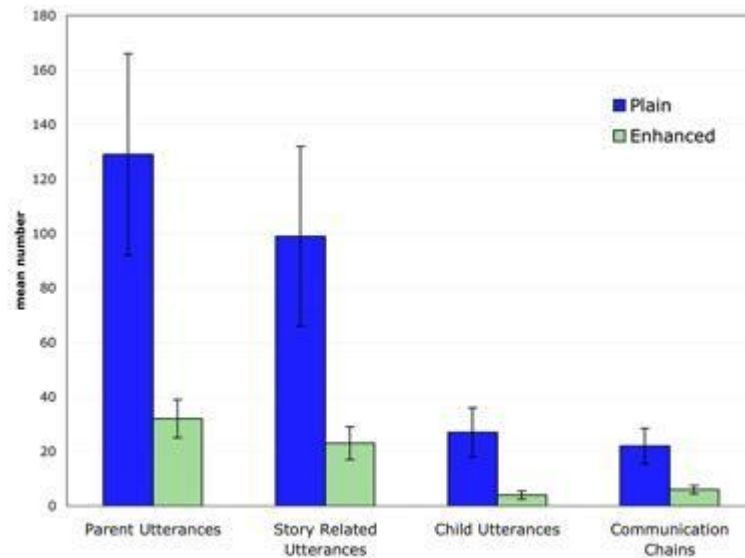


Figure 1. Mean number of total parent, child, and story related utterances and communication chains by e-book condition. Standard errors are represented in the figure by the error bars attached to each column.

**Communication chains:** There were also significant differences between conditions in both measures of communication chains. The total number of communication chains was significantly higher for dyads reading plain e-books ( $M=20$ ,  $SD=19$ ) than enhanced e-books ( $M=5$ ,  $SD=5$ ), corrected:  $t(17)=2.95$ ,  $p<.01$ , and the average length of communication chains was higher in the plain ( $M=2.30$ ,  $SD=.76$ ) than in the enhanced e-book condition ( $M=1.60$ ,  $SD=.66$ ),  $t(24)=2.52$ ,  $p<.05$ . These findings suggest that the plain e-books were more effective at promoting longer back-and-forth communication between parents and children during the stories.

**Instances of eye contact:** While, on average there were more instances of eye contact between parents and children in the plain ( $M=6.8$ ,  $SD=9.3$ ) compared to the enhanced e-book condition ( $M=3.3$ ,  $SD=7.5$ ), this difference was not significant ( $p>.10$ ). Thus, this measure, which appeared to depend on the parent-child seating arrangement (e.g., child on parent's lap vs. side-by-side seating), did not depend on condition.

### ***Engagement With Story***

Children were found to spend proportionally more time looking at the iPad during stories in the enhanced ( $M=.93$ ,  $SD=.08$ ), than in the plain e-book condition ( $M=.73$ ,  $SD=.18$ ), corrected:  $t(20)=-3.97$ ,  $p<.01$ . However, qualitatively we found no systematic differences between the children in the plain vs. enhanced conditions in how generally attentive or distracted they were during the stories or whether they reported to enjoy them afterwards.

### ***Retention After Reading***

There was no difference in how many challenging words children correctly identified in the vocabulary retention tests between the enhanced ( $M=7.47$ ,  $SD=1.47$ ) and the plain e-book condition ( $M=7.16$ ,  $SD=1.83$ ),  $t(36)=-.14$ ,  $p>.80$ , and while these means were high, only two children (one in each condition) correctly identified all 10 items, thus the vocabulary test was adequately challenging to avoid ceiling effects. While there was a significant difference between the number of story events that children recalled directly after each story between the enhanced ( $M=6.55$ ,  $SD=4.06$ ) and the plain condition ( $M=4.00$ ,  $SD=2.79$ ),  $t(36)=-2.26$ ,  $p<.05$ , this finding was not reliable because the difference was *not* significant when children's age was taken into account in the overall ANCOVA reported above. Additionally, there were no correlations found between any of the measures of interaction or engagement and how children performed on either of these retention tasks, nor between the two retention tasks themselves.

### **Discussion**

The present study on the different possible effects of parents reading plain, non-narrated e-books with their children compared to parents and children co-reading enhanced e-books adds to the growing number of findings that may encourage caregivers and researchers to think carefully about the type of e-book they choose to read with young children and the features of e-books they choose to employ. Our



results indicated that in terms of children's qualitative engagement with the stories, or in the vocabulary or story events they remembered from the stories, there were no significant differences between hearing the stories in an enhanced e-book compared to a plain e-book format. However, the results do suggest that when reading enhanced e-books, children spent more time visually attending to the stories (and the device), but when reading plain e-books, parents and children were more interactive with each other on all measures. These findings suggest that plain and enhanced e-books were equally effective in aiding children's retention of new words and story events, especially when the features of the enhanced e-book were considerate and well-integrated into the story. However, plain e-books read by a live and familiar adult caregiver provide more opportunities for promoting extended and meaningful extra-textual conversation.

Given other research that has shown equal engagement with and retention from e-books compared to print books (e.g., Chiong et al, 2012; De Jong and Bus, 2002; 2004; Korat et al, 2013) we were not initially surprised that our comparison within e-book type also did not show differences in vocabulary learning and story event retention. Our measures were immediate and shallow after only one experience with each story. It may take more repetitions for deeper differences to emerge in just how well a child can learn and remember from different presentation types.

On the other hand, the increased amount of verbal and nonverbal interaction that parents and children had when the e-book's narration and hotspots were disabled in the plain condition illustrate just how dramatically even considerate features of the e-book can change the structure of the reading experience for a parent-child dyad. In the enhanced e-book condition, there was a third voice present - that of the e-book itself - not only telling the story but asking questions and responding to the child's actions towards the screen. When the parent is the only narrator he or she gets more involved, controls the pace, and the types of questions. The advantage here is that the parent can be more tuned in to the child's individual interests, abilities, and motivations. For example, one parent-child dyad in our study had the following exchange, illustrating how

rich and idiosyncratic learning experiences can be when a familiar adult and a child engage in extra-textual conversation:

*Mom: "There's lots of sick animals. Animals who are sick, they come from all over the world! Which countries do they come from?"*

*Child: "India."*

*Mom: "Could be from India. Where else?"*

*Child: "Poland."*

*Mom: "Poland. Ok. Where else?"*

*Child: "Croatia."*

*Mom: "Croatia. Ok. All right?"*

*Child: "China."*

*Mom: "China, maybe. We'll find out."*

In the enhanced condition, by contrast, the parent may become more passive about extra-textual talk and questions and thus be more likely to watch the story with the child than to highlight material from the book for discussion. Some parents in the study noted that when they did interject during the enhanced condition, they felt they were interrupting the narrator or the narrator was interrupting them. Thus even though parents could pause the story to comment, clarify, or ask a question, they ended up censoring themselves.

Lastly, what are we to make of the difference in children's engagement with the stories between the plain and enhanced e-books? In the enhanced condition children spent more of their time visually attending to the iPad, but is this an indicator that the enhanced stories were more engaging, or is it a byproduct of the change in parent-child interaction in this condition? If the parents in the enhanced e-book condition became more passive as the third voice of the story narrator took the lead, perhaps that is why children were consistently fixated on the iPad - that was where most of the interaction was coming from. In the end, it is difficult to say whether this attention shift was beneficial (e.g., promotes independence) or detrimental (e.g., reduces parent-child connection) for the child, and in other ways children seemed to enjoy and attend to the

stories in each condition equally. However, the two types of e-books did afford qualitatively different kinds of experience.

While our findings are an important step towards understanding the quality and effectiveness of e-book reading with preschool-aged children, there are still questions left that warrant further research. First, all of the benefits of story reading depend on the quality of the stories that we choose. For this study, we used a commercially available e-story application that had been recommended by mothers' groups. The My Story World© app contained age-appropriate narrative stories, which other research suggested would inspire quality interaction between parents and children (e.g., Nyhout and O'Neil, 2013), and the enhanced version of the stories contained features considered to be more supportive to children (e.g., relevant plot and vocabulary questions) rather than distracting or detracting hotspots. However, it is just one of numerous available e-reading apps. Future research on other popular story apps as well as researcher-designed e-books could go further to determine what optimizes an e-book for child learning as well as entertainment.

In addition, our retention measures were of *immediate* recall of story events and vocabulary that had been heard only once. Future research should deepen our understanding of how e-book reading (of one kind or another) could impact long-term retention after repeated exposure with the same stories, considering we know that children often read and request the same stories and that repeated reading can affect learning and retention (e.g., Horst, Parsons and Bryan, 2011).

Finally, parents in this sample were "good" readers - educated, fluent in the language of the story, and spontaneously engaging in dialogic reading with their child. Thus they are likely to be at the high end of many measures of parent-child interaction. While this did not affect our between-condition findings within the sample, it raised the question for future research of whether the parent-child interactions in our study overestimate the reality of interaction in real, at-home experiences. In this study the parents were often just as capable of engaging the child in the story as was the technology of the enhanced e-books - while parents averaged 100 extra-textual

comments and 30 conversation chain starters in the plain condition, in the enhanced condition the device offered between 5 and 10 opportunities to interact extra-textually. However questions remain about the extent to which the parent and the technology work in concert to produce a high quality story experience? Further work is needed to investigate whether parents compensate when a story is unsuccessful at capturing a child's interest or when the technology is distracting, and whether a well-designed e-book could compensate when a parent is less capable of quality dialogic reading.

In summary, it is essential to consider the goal of a shared reading experience in evaluating the contribution of different types of e-books to the possible benefits for young children. If the goal is for the child to be attentive, or for the child to simply remember what she has just heard, then reading a plain vs. enhanced e-book may not matter. However, if the goal is for the child to have conversations beyond the story that are meaningful and relevant to him or her, then it may be better to turn off the enhanced features and read the e-book plain.

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